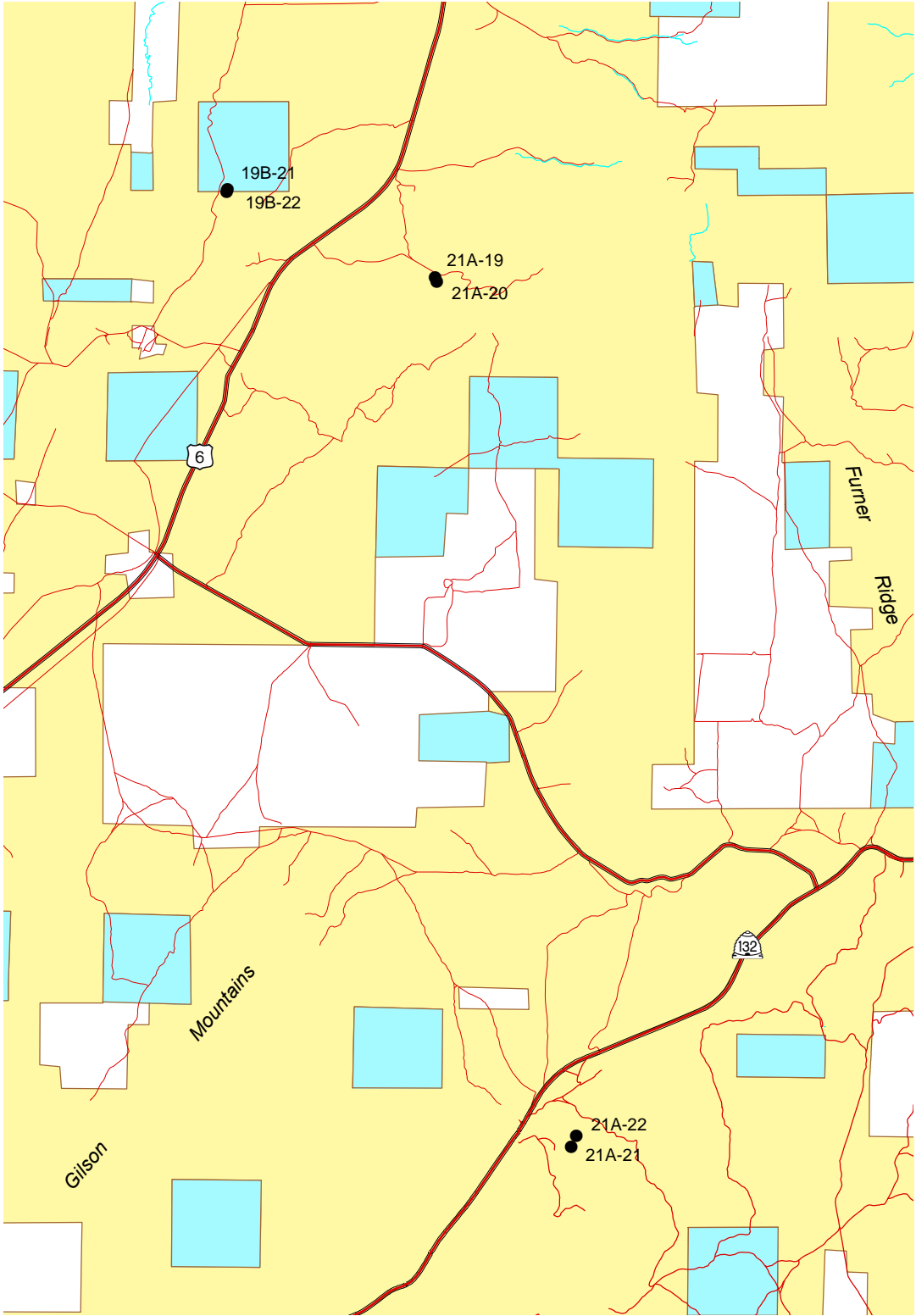


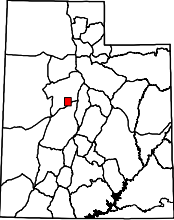
# Burn Rehab Treatment Area



Map Scale 1:115,249 (1 inch = 1.8 miles)

Map Location

- BLM
- State of Utah
- Private Land
- Water Body
- Major Road
- Minor Road
- Water Course



## LEAMINGTON BURN COMPLEX SPECIAL STUDIES

### Introduction

In 1996, Utah experienced one of its most active, extensive, and devastating fire seasons in history. In Millard and Juab Counties alone, some 250,000 acres (101,171 ha) burned. The Leamington complex was the largest burned area, covering approximately 138,340 acres (55,984 ha) of mostly pinyon-juniper woodland. Rehabilitation efforts began in the fall of 1996, which included drilling the more accessible low-lying areas, with the remainder being aurally seeded and one-way chained to cover the seed. On the Leamington complex, about 6,100 acres (2,469 ha) were treated with a rangeland drill, 10,736 acres (4,345 ha) were aurally seeded and one-way chained, and 8,308 acres (3,362 ha) were aurally seeded only. Aurally seeding and then chaining is an effective method of breaking up burned trees, which provide valuable surface litter to help protect the soil from erosion. Chaining also enhances seed establishment by covering the seed with soil and litter. This practice was stopped temporarily because of concerns voiced by environmental and Native American groups with regard to archeological resources in the burned areas, even though an archeological survey had been completed. In 1997, two studies named Leamington Burn and Chain (21A-21) and Leamington Burn (21A-22) were established. One was placed in a burned and seeded area, and the other in an area that had been burned, seeded, then chained one-way. Additional pairs of studies were established in 1998; two near Jericho (19B-21 and 19B-22), and two near Paul Bunyan (21A-19 and 21A-20) to monitor the effects of treatments to those at the Leamington sites. The purpose of these studies was to monitor and compare the recovery of these areas following rehabilitation using seeding alone and seeding and chaining.

### Seed Lists

#### **Jericho State Section (19B-21)**

##### Aerial Seed Mix

Species	Pounds per acre	Kg per ha
High Crest ( <i>Agropyron cristatum</i> )	5	5.6
Intermediate Wheatgrass ( <i>Agropyron intermedium</i> )	3	3.4
Alfalfa ( <i>Medicago sativa</i> )	1	1.1
Yellow Sweet Clover ( <i>Melilotus officinalis</i> )	0.5	0.6

#### **Jericho BLM Section (19B-22)**

##### Aerial Seed Mix

Species	Pounds per acre	Kg per ha
High Crest ( <i>Agropyron cristatum</i> )	3.1	3.5
Rye ( <i>Elymus junceus</i> )	2.1	2.4
Tall wheatgrass ( <i>Agropyron elongatum</i> )	2.0	2.3
Smooth Brome ( <i>Bromus inermis</i> )	1.9	2.1

##### Dribbler Seed Mix

Fourwing saltbush ( <i>Atriplex canescens</i> )	1.0	1.1
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**Paul Bunyan Burn (21A-19) and Paul Bunyan Burn and Chain (21A-20)**

## Aerial Mix

Species	Pounds of Seed	Pounds per acre
Hycrest crested wheatgrass ( <i>Agropyron cristatum</i> )	15,100	4.0
Russian wildrye ( <i>Elymus junceus</i> )	11,350	3.0
Elongated wheatgrass ( <i>Agropyron elongatum</i> )	7,500	2.0

## Dribbler Mix

Fourwing saltbush ( <i>Atriplex canescens</i> )	3,800	1.0
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**Leamington Burn (21A-22) and Leamington Burn and Chain (21A-21)**

## Aerial Mix

Species	Pounds of seed	Pounds per acre
Hycrest crested wheatgrass ( <i>Agropyron cristatum</i> )	12,450	3.3
Russian wildrye ( <i>Elymus junceus</i> )	12,450	3.3
Elongated wheatgrass ( <i>Agropyron elongatum</i> )	8,300	2.2
Great Basin wildrye ( <i>Elymus cinereus</i> )	2,000	0.53
Smooth brome ( <i>Bromus inermis</i> )	600	0.16
Alfalfa ( <i>Medicago sativa</i> )	1,200	0.32
Small burnet ( <i>Sanguisorba minor</i> )	500	0.13

## Dribbler Mix

Fourwing saltbush ( <i>Atriplex canescens</i> )	3,700	1.0
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### Trend Study 19B-21-07

Study site name: Jericho State Section.

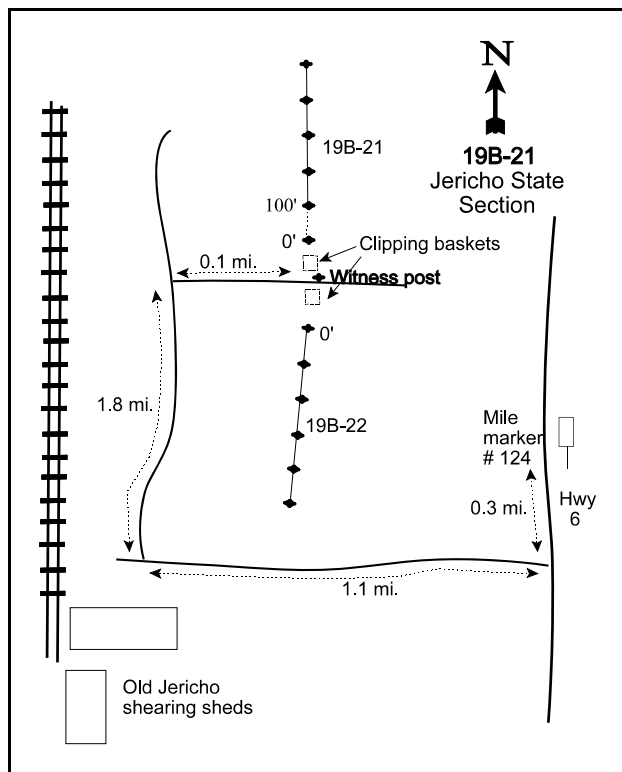
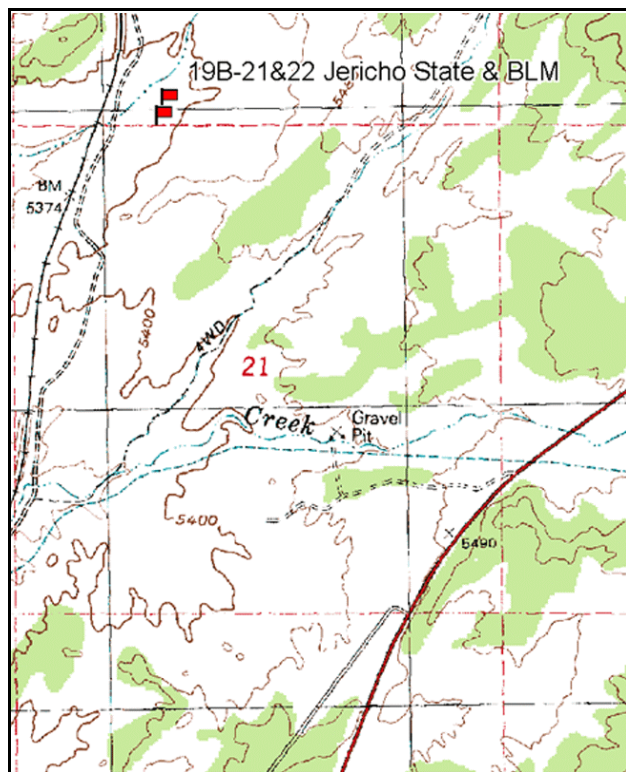
Vegetation type: Burn.

Compass bearing: frequency baseline 0 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

### LOCATION DESCRIPTION

From mile marker 124 on Hwy 6, drive 0.1 miles south to a road heading west. Take this road for 1.1 miles to the old Jericho shearing sheds on the left and an intersection before the railroad tracks. Turn right and follow the road on the east side of the tracks for 1.8 miles. At this point is the border of state land and BLM land. Park here and walk for 0.1 miles to a witness post and some clipping baskets. The 0-foot stake is 100 feet directly north of the witness post.



Map Name: McIntyre

Diagrammatic Sketch

Township 12S, Range 3W, Section 16

GPS: NAD 83, UTM 12S 398135 E 4403208 N

## DISCUSSION

### Jericho State Section - Trend Study No. 19B-21

#### Study Information

This study is located in Tintic Valley west of U.S. Highway 6, and north of the old Jericho sheep shearing sheds [elevation: 5,400 feet (1,646 m), slope: 5%, aspect: southwest]. The area was part of the extensive Leamington burn complex of 1996. The fire eliminated the dense sagebrush stand that had been present. This study samples a section of land owned by the State of Utah that was aerially seeded after the fire. The study was not chained to cover the seed. In 1998, pellet group data suggested that there was little rabbit use and sign of only a few trespass cattle. From the pellet group transect, sheep use was estimated at 64 days use/acre (159 sdu/ha) in 2002 and 39 days use/acre (96 sdu/ha) in 2007. No wildlife droppings were sampled in the pellet group transect, though deer pellets were sampled in quadrats in 2002 and 2007.

#### Soil

The study lies within the Wales loam soil series and consists of very deep, well-drained, moderate to moderately-slowly permeable soils. Soils in this series formed in alluvium derived from sandstone, shale, limestone, and igneous rocks, and are found on alluvial fans and plains. Soil depths are typically in excess of 4 feet (1.2 m) and have been disturbed by cultivation (USDA-NRCS 2007). At the study, the soil has a loam texture, and there is very little rock or pavement either on the surface or in the profile. The soil has a neutral reactivity with a pH of 7.1. The phosphorus concentration is 3.8 ppm, which is below the 6 ppm threshold that may limit normal plant growth and development (Tiedemann and Lopez 2004). Relative bare ground cover was high (52%) in 1998 and 2002, and slightly decreased in 2007 (47%). The presence of shallow gullies indicate that erosion occurred in the past, but these channels are now filled with grasses and forbs. The erosion condition was classified as stable in 2002 and increased to slight in 2007 due mainly to moderate pedestalling and light soil movement, gully and rill erosion, and flow patterns..

#### Browse

Before the 1996 fire consumed all of the basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), the estimated sagebrush density was 5,600 plants/acre (13,861 plants/ha). This estimate was made from the number of burned sagebrush stems measured in 1998. Following the wildfire, no surviving shrubs have been sampled, and none were included in the seed mix.

#### Herbaceous Understory

The herbaceous understory accounts for all of the vegetation cover, and perennial grasses are the most abundant of the herbaceous species. Perennial grass cover has been constant at 17% since 1998. Crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Agropyron intermedium*) were seeded after the fire and have been two of the dominant grasses. Western wheatgrass (*Agropyron smithii*) was not included in the seed mix, but was first sampled in 2002 and has increased in frequency and cover. Other perennial grasses that are present, but infrequent, include Russian wildrye (*Elymus junceus*), Indian ricegrass (*Oryzopsis hymenoides*), and bottlebrush squirreltail (*Sitanion hystrix*). Cheatgrass (*Bromus tectorum*) has been present in all sample years. Cheatgrass cover has fluctuated from less than 1% to 6%.

Perennial forb cover has decreased from 21% in 1998 to less than 1% in 2007. The diversity of the forb component has been low. Two seeded species, yellow sweet clover (*Melilotus officinalis*) and alfalfa (*Medicago sativa*), dominated the forb component in 1998 and provided 94% of the forb cover. Both species were large and vigorous. The frequency and cover of both species decreased dramatically in 2002 and 2007. Grasshoppers and Mormon crickets heavily utilized the yellow sweetclover in 1997 and alfalfa in 2002. Annual forbs accounted for 97% of forb cover in 2007, and desert alyssum (*Alyssum desertorum*) was the dominant species.

## 2002 TREND ASSESSMENT

Browse species are absent and so the trend is considered to be stable. The grass trend is stable. The sum of nested frequency of perennial grasses decreased 10%; much of the decrease was attributed to the significant decrease in intermediate wheatgrass. However, there was also a significant decrease in cheatgrass. The forb trend is down. The sum of nested frequency of perennial forbs decreased 41%, and the number of forb species decreased from 11 to three. Quadrat frequency of yellow sweet clover decreased from 40% to 0%. Alfalfa vigor was much reduced and plants were being defoliated by Mormon crickets (*Anabrus simplex*). The 1998 Desirable Components Index (DCI) score was fair due to the non-existent browse cover, but high perennial grass and forb cover. In 2002, the DCI score remained fair.

1998 winter range condition (DCI) - fair (36) Low potential scale

2002 winter range condition (DCI) - fair (40) Low potential scale

browse - stable (0)

grass - stable (0)

forb - down (-2)

## 2007 TREND ASSESSMENT

The browse trend continues to be stable. The grass trend is stable. The sum of nested frequency of perennial grasses increased 11%, but there was a significant increase in the nested frequency of cheatgrass. The forb trend is down. The sum of nested frequency of perennial forbs decreased 86%, which was attributed to the significant decrease in alfalfa. The DCI score remained fair.

winter range condition (DCI) - fair (29) Low potential scale

browse - stable (0)

grass - stable (0)

forb - down (-2)

## HERBACEOUS TRENDS --

Management unit 19B, Study no: 21

Type	Species	Nested Frequency			Average Cover %		
		'98	'02	'07	'98	'02	'07
G	Agropyron cristatum	<sub>a</sub> 250	<sub>ab</sub> 292	<sub>b</sub> 315	9.84	15.13	13.07
G	Agropyron intermedium	<sub>b</sub> 159	<sub>a</sub> 41	<sub>a</sub> 54	6.69	1.22	1.75
G	Agropyron smithii	-	<sub>a</sub> 45	<sub>a</sub> 59	-	.27	2.25
G	Bromus tectorum (a)	<sub>c</sub> 247	<sub>a</sub> 37	<sub>b</sub> 168	5.99	.47	1.01
G	Elymus junceus	-	5	-	-	.30	-
G	Oryzopsis hymenoides	<sub>a</sub> 4	<sub>a</sub> 6	-	.03	.33	-
G	Sitanion hystrix	<sub>b</sub> 18	-	<sub>a</sub> 6	.79	-	.18
Total for Annual Grasses		247	37	168	5.99	0.47	1.01
Total for Perennial Grasses		431	389	434	17.36	17.26	17.27
Total for Grasses		678	426	602	23.35	17.74	18.28
F	Alyssum desertorum (a)	<sub>a</sub> 13	<sub>a</sub> 10	<sub>b</sub> 297	.19	.02	2.28
F	Astragalus sp.	3	-	-	.03	-	-
F	Descurainia pinnata (a)	<sub>a</sub> 3	-	<sub>a</sub> 2	.00	-	.03
F	Draba sp. (a)	-	-	5	-	-	.01
F	Erigeron sp.	2	-	-	.15	-	-
F	Melilotus officinalis	93	-	-	8.05	-	-

Type	Species	Nested Frequency			Average Cover %		
		'98	'02	'07	'98	'02	'07
F	Medicago sativa	<sub>b</sub> 175	<sub>b</sub> 164	<sub>a</sub> 20	12.24	6.72	.03
F	Phlox hoodii	2	-	-	.15	-	-
F	Phlox longifolia	<sub>a</sub> 2	-	<sub>a</sub> 1	.03	-	.03
F	Potentilla gracilis	1	-	-	.15	-	-
F	Sisymbrium altissimum (a)	<sub>a</sub> 10	-	<sub>a</sub> 21	.49	-	.33
F	Sphaeralcea coccinea	<sub>a</sub> 2	<sub>a</sub> 2	<sub>a</sub> 2	.03	.01	.00
Total for Annual Forbs		26	10	325	0.68	0.02	2.66
Total for Perennial Forbs		280	166	23	20.84	6.73	0.07
Total for Forbs		306	176	348	21.53	6.75	2.73

#### BASIC COVER --

Management unit 19B, Study no: 21

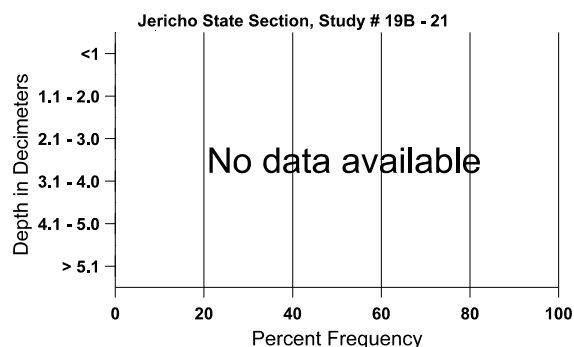
Cover Type	Average Cover %		
	'98	'02	'07
Vegetation	41.50	26.00	24.68
Rock	.13	.06	.09
Pavement	.80	.84	.39
Litter	10.19	27.91	34.09
Cryptogams	0	.31	.36
Bare Ground	56.47	59.64	52.12

#### SOIL ANALYSIS DATA --

Herd Unit 19B, Study no: 21, Jericho State Section

Effective rooting depth (in)	Temp °F (depth)	pH	Loam			%OM	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
16.1	67.0 (17.5)	7.1	44.0	31.1	24.9	.9	3.8	278.4	.6

### Stoniness Index



PELLET GROUP DATA --

Management unit 19B, Study no: 21

Type	Quadrat Frequency		
	'98	'02	'07
Sheep	-	16	6
Rabbit	2	2	35
Elk	-	-	1
Deer	-	3	6
Cattle	-	-	1

Days use per acre (ha)	
'02	'07
64 (159)	39 (96)
-	-
-	-
-	-
-	-

BROWSE CHARACTERISTICS --

Management unit 19B, Study no: 21

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata tridentata												
98	0	-	-	-	-	5600	0	0	-	-	0	-/-
02	0	-	-	-	-	-	0	0	-	-	0	-/-
07	0	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia sp.												
98	0	-	-	-	-	40	0	0	-	-	0	-/-
02	0	-	-	-	-	-	0	0	-	-	0	-/-
07	0	-	-	-	-	-	0	0	-	-	0	-/-



Trend Study 19B-22-07

Study site name: Jericho BLM.

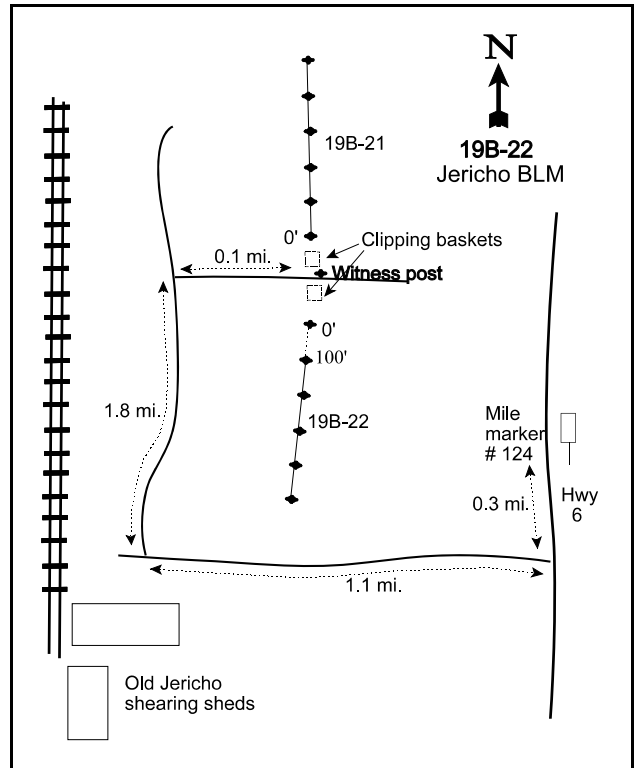
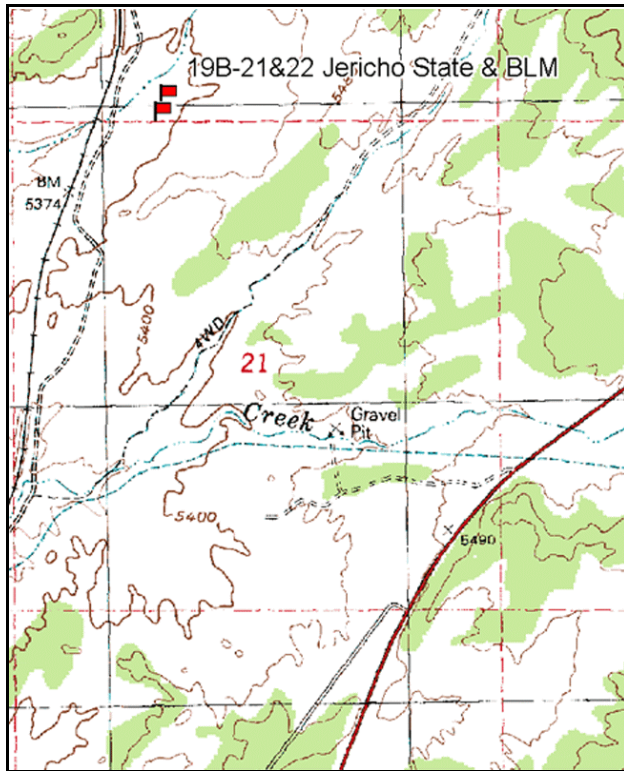
Vegetation type: Burn.

Compass bearing: frequency baseline 0 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From mile marker 124 on Hwy 6, drive 0.1 miles south to a road heading west. Take this road for 1.1 miles to the old Jericho shearing sheds on the left and an intersection before the railroad tracks. Turn right and follow the road on the east side of the tracks for 1.8 miles. At this point is the border of state land and BLM land. Turn right and follow the faint road along the border for 0.1 miles to a witness post and some clipping baskets. The 0-foot stake is 100 feet at 192 degrees magnetic from the witness post. The 0-foot stake has browse tag #475.



Map Name: McIntyre

Diagrammatic Sketch

Township 12S, Range 3W, Section 16

GPS: NAD 83, UTM 12S 398115 E 4403152 N

## DISCUSSION

### Jericho BLM - Trend Study No. 19B-22

#### Study Information

This study is located in Tintic Valley west of U.S. Highway 6, and north of the old Jericho sheep shearing sheds and is adjacent to the Jericho State Section study (19B-21) [elevation: 5,400 feet (1,646 m), slope: 5%, aspect: southwest]. The area was part of the extensive Leamington burn complex of 1996. The fire eliminated the dense sagebrush stand that had been present. This study samples a section of land managed by the Bureau of Land Management that was aerially seeded and then one-way chained with an Ely chain after the fire. Fourwing saltbush (*Atriplex canescens*) seed was applied using a dribbler during the chaining. The 1998 pellet group transect sampled only one deer pellet group and a few trespass cattle pats. From the pellet group transect, sheep use was estimated at 36 days use/acre (88 sdu/ha) in 2002 and 40 days use/acre (99 sdu/ha) in 2007. Deer pellets were sampled in only three quadrats in 2002 and in one in 2007.

#### Soil

The study lies within the Wales loam soil series and consists of very deep, well-drained, moderate to moderately-slowly permeable soils. The soils in this series formed in alluvium derived from sandstone, shale, limestone, and igneous rocks, and are found on alluvial fans and plains. Soil depths are typically in excess of 4 feet (1.2 m) and have been disturbed by cultivation (USDA-NRCS 2007). At the study, the soil has a loam texture, with very little rock or pavement either on the surface or in the profile. The pH is neutral (7.3). Percent organic matter is 2.5 times higher than the adjacent, unchained study. The phosphorus concentration is 3.8 ppm, which is below the 6 ppm threshold that may limit normal plant growth and development (Tiedemann and Lopez 2004). Relative bare ground cover is abundant and was 47% in 1998, 51% in 2002, and 39% in 2007. The erosion condition was classified as stable-slight in 2002 and stable in 2007. Severe pedestalling around the base of bunchgrasses provides most of the evidence of past erosion.

#### Browse

Before the 1996 fire consumed all of the basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), the estimated sagebrush density was 2,640 plants/acre (6,535 plants/ha), only about half as many plants as on the adjacent study. This estimate was made from the number of burned sagebrush stems measured in 1998 and may be skewed due to the disturbance of burned stems that occurred during the chaining. No living sagebrush plants have been sampled since the burn.

Fourwing saltbush is the only key browse species sampled since the fire. The density of fourwing saltbush has decreased from 400 plants/acre (990 plants/ha) in 1998 to 180 plants/acre (446 plants/ha) in 2007. No seedling saltbush have ever been sampled, and young plants were only sampled in 1998. There were no decadent plants in 1998, but decadent plants comprised about 80% of the population in successive samplings. The proportion of plants exhibiting poor vigor has ranged from 0% to 80%, and all plants with poor vigor were classified as dying. The average height and crown measurements have steadily increased. Together, the density and height and crown data suggest that the population is composed of fewer, but larger plants. Browse use on fourwing saltbush has been light to light-moderate.

#### Herbaceous Understory

The vegetative component is dominated by the herbaceous understory, in particular by seeded perennial grasses. Perennial grass cover was 24% in 1998, 22% in 2002, and 17% in 2007. The dominant perennial grasses are crested wheatgrass (*Agropyron cristatum*) and tall wheatgrass (*Agropyron elongatum*), which together have comprised 53% to 78% of the total vegetative cover. Two other seeded species, Russian wildrye (*Elymus junceus*) and smooth brome (*Bromus inermis*), are present at lower frequencies. Western wheatgrass (*Agropyron smithii*), bluebunch wheatgrass (*Agropyron spicatum*), and bottlebrush squirreltail (*Sitanion hystrix*) have also been measured at low frequencies. Cheatgrass (*Bromus tectorum*) cover decreased from

10% in 1998 to less than 1% in 2002, then increased to 2% in 2007. Japanese brome (*Bromus japonicus*) was sampled for the first time in 2007, but only in two quadrats.

In contrast to the seed mix at the adjacent study (19B-21), no forbs were included in the BLM seed mix. Perennial forb cover has been 0% since 1998, and annual cover has averaged 2% since 1998. The dominant forbs have been desert alyssum (*Alyssum desertorum*) and tumblemustard (*Sisymbrium altissimum*).

## 2002 TREND ASSESSMENT

The browse trend is down. The density of fourwing saltbush decreased 50%. There were no seedling or young plants measured. Decadence increased from 0% of the population to 80%, and all of the decadent shrubs were classified as dying. The density of dead plants increased from 0 plants/acre to 60 plants/acre (149 plants/ha). The decrease in fourwing saltbush was attributed to a region-wide drought (Utah Climate Summaries 2007) and sheep browsing. The grass trend is up. The sum of nested frequency of perennial grasses increased 15%, and two previously-absent native grasses were sampled: western wheatgrass and bluebunch wheatgrass. There was a significant decrease in the nested frequency of cheatgrass; quadrat frequency decreased from 94% to 7%. The forb trend is stable. The sum of nested frequency of perennial forbs decreased 83%, but perennial forbs already existed at extremely low frequencies. Annual forbs also decreased so that there were few forbs present. Again, the decrease in forbs was attributed to drought conditions. The 1998 Desirable Components Index (DCI) score was poor-fair due to the low browse and perennial forb cover, high annual grass cover, but high perennial grass cover. In 2002, the DCI score increased to fair due to the decrease in annual grass cover.

1998 winter range condition (DCI) - poor-fair (23) Low potential scale

2002 winter range condition (DCI) - fair (31) Low potential scale

browse - down (-2)

grass - up (+2)

forb - stable (0)

## 2007 TREND ASSESSMENT

The browse trend is stable. The density of fourwing saltbush decreased 10%, and there were still no seedling or young plants measured. Decadence remained high at 78% of the population but only 43% of the decadent plants were classified as dying. The density of dead plants did not change. Browse use shifted to light-moderate. The grass trend is slightly down. The sum of nested frequency of perennial grasses decreased 12%, including significant decreases in the nested frequencies of smooth brome and western wheatgrass. Cheatgrass significantly increased in nested frequency, and was measured in 78% of the quadrats. The forb trend is stable. The sum of nested frequency of perennial grasses did not change. Although there was a marked increase in annual forbs, the species have low forage value. The DCI score remained fair.

winter range condition (DCI) - fair (29) Low potential scale

browse - stable (0)

grass - slightly down (-1)

forb - stable (0)

## HERBACEOUS TRENDS --

Management unit 19B, Study no: 22

Type	Species	Nested Frequency			Average Cover %		
		'98	'02	'07	'98	'02	'07
G	Agropyron cristatum	<sub>a</sub> 133	<sub>b</sub> 193	<sub>b</sub> 224	5.14	10.33	9.42
G	Agropyron elongatum	<sub>b</sub> 198	<sub>a</sub> 108	<sub>a</sub> 93	14.29	7.15	4.66
G	Agropyron smithii	-	<sub>b</sub> 87	<sub>a</sub> 40	-	1.35	.75

T y p e	Species	Nested Frequency			Average Cover %		
		'98	'02	'07	'98	'02	'07
G	Agropyron spicatum	-	5	-	-	.15	-
G	Bromus inermis	<sub>b</sub> 35	<sub>b</sub> 46	<sub>a</sub> 21	1.29	.51	.30
G	Bromus japonicus (a)	-	-	3	-	-	.01
G	Bromus tectorum (a)	<sub>c</sub> 334	<sub>a</sub> 14	<sub>b</sub> 244	9.84	.06	1.72
G	Elymus junceus	<sub>a</sub> 35	<sub>a</sub> 35	<sub>a</sub> 57	1.79	1.83	1.99
G	Oryzopsis hymenoides	-	-	-	.00	-	-
G	Sitanion hystrix	<sub>b</sub> 31	<sub>ab</sub> 21	<sub>a</sub> 2	1.79	.48	.03
G	Vulpia octoflora (a)	-	-	2	-	-	.03
Total for Annual Grasses		334	14	249	9.84	0.06	1.75
Total for Perennial Grasses		432	495	437	24.32	21.83	17.16
Total for Grasses		766	509	686	34.17	21.89	18.92
F	Agoseris glauca	3	-	-	.00	-	-
F	Alyssum desertorum (a)	<sub>b</sub> 87	<sub>a</sub> 13	<sub>c</sub> 392	.62	.03	2.46
F	Calochortus nuttallii	2	-	-	.00	-	-
F	Collinsia parviflora (a)	-	-	3	-	-	.00
F	Descurainia pinnata (a)	<sub>a</sub> 4	-	<sub>a</sub> 1	.01	-	.00
F	Draba sp. (a)	-	-	3	-	-	.00
F	Helianthus annuus (a)	-	-	3	-	-	.03
F	Lactuca serriola	-	-	1	-	-	.00
F	Senecio multilobatus	1	-	-	.00	-	-
F	Sisymbrium altissimum (a)	<sub>b</sub> 33	<sub>a</sub> 2	<sub>a</sub> 7	1.91	.00	.07
F	Sphaeralcea grossulariifolia	<sub>a</sub> -	<sub>a</sub> 1	-	.00	.00	-
Total for Annual Forbs		124	15	409	2.54	0.03	2.58
Total for Perennial Forbs		6	1	1	0.01	0.00	0.00
Total for Forbs		130	16	410	2.56	0.03	2.59

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 19B, Study no: 22

T y p e	Species	Strip Frequency			Average Cover %		
		'98	'02	'07	'98	'02	'07
B	Atriplex canescens	16	9	8	.33	.58	.59
B	Opuntia sp.	0	1	1	-	-	-
Total for Browse		16	10	9	0.32	0.58	0.59

CANOPY COVER, LINE INTERCEPT --

Management unit 19B, Study no: 22

Species	Percent Cover	
	'02	'07
Atriplex canescens	-	1.39

BASIC COVER --

Management unit 19B, Study no: 22

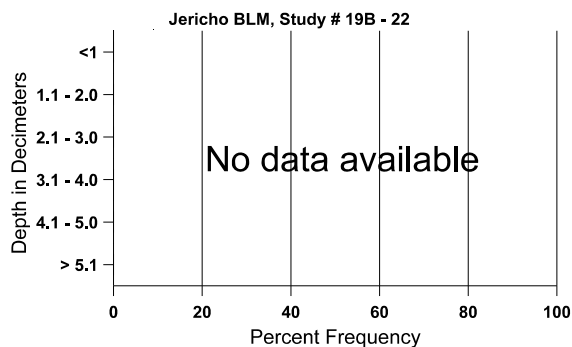
Cover Type	Average Cover %		
	'98	'02	'07
Vegetation	39.77	24.76	25.07
Rock	.11	.12	.22
Pavement	2.41	2.14	1.58
Litter	14.53	26.26	36.72
Cryptogams	0	.04	2.11
Bare Ground	49.61	56.15	42.34

SOIL ANALYSIS DATA --

Herd Unit 19B, Study no: 22, Jericho BLM

Effective rooting depth (in)	Temp °F (depth)	pH	Loam			%OM	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
17.5	67.4 (17.7)	7.3	44.0	30.1	25.9	2.5	4.0	364.8	.7

## Stoniness Index



PELLET GROUP DATA --

Management unit 19B, Study no: 22

Type	Quadrat Frequency		
	'98	'02	'07
Sheep	-	17	7
Rabbit	1	4	20
Deer	-	3	1

Days use per acre (ha)	
'02	'07
35 (88)	40 (99)
-	-
-	-

BROWSE CHARACTERISTICS --  
Management unit 19B, Study no: 22

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata</i> tridentata												
98	0	-	-	-	-	2640	0	0	-	-	0	-/-
02	0	-	-	-	-	-	0	0	-	-	0	-/-
07	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Atriplex canescens</i>												
98	400	-	300	100	-	-	0	0	0	-	0	17/17
02	200	-	-	40	160	60	10	30	80	80	80	26/37
07	180	-	-	40	140	60	33	11	78	33	33	40/56
<i>Opuntia</i> sp.												
98	0	-	-	-	-	-	0	0	0	-	0	-/-
02	20	-	-	-	20	-	0	0	100	100	100	2/3
07	20	-	-	20	-	-	0	0	0	-	0	-/-

### Summary and Comparison of Jericho State Section (19B-21) and Jericho BLM (19B-22)

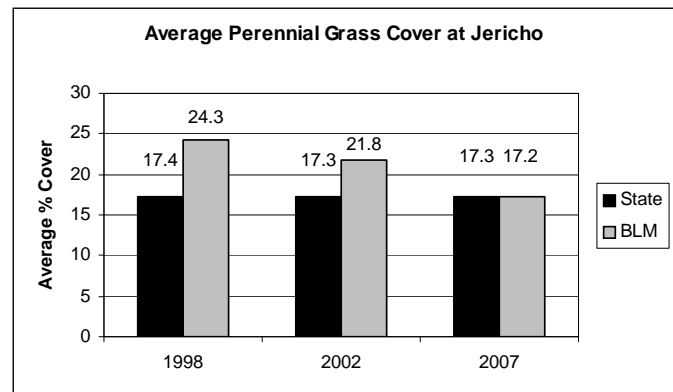
These studies were established in 1998 to monitor the effect of chaining on vegetation recovery following the Leamington wildfire complex that burned through the area in 1996. The Jericho State Section study was seeded only, while the Jericho BLM study was seeded and then one-way chained. The purpose of the chaining was to cover the seed and to prepare the seedbed. Both processes enhance the establishment of the seeded species.

In addition to the type of treatment, these two studies had different seed mixes. Yellow sweet clover (*Melilotus officinalis*) and alfalfa (*Medicago sativa*) were included in the Jericho State Section seed mix, whereas there were no forbs in the Jericho BLM seed mix. Additionally, fourwing saltbush (*Atriplex canescens*) was included only in the Jericho BLM seed mix. The grass and forb seeds were aerially broadcast, and fourwing saltbush seeds were applied with a dribbler during the chaining. A total of 8 pounds of grass seed/acre (9 kg/ha) were seeded on the state section, while 9.1 pounds of grass seed/acre (10.7 kg/ha) were seeded onto the BLM study. It is difficult to determine if the difference in seeding rates accounted for some of the difference in vegetation recovery, or if the difference resulted from the chaining alone. However, since the difference between the seeding rates is relatively small, the difference in the vegetation recovery between the two studies is likely the result of the chaining.

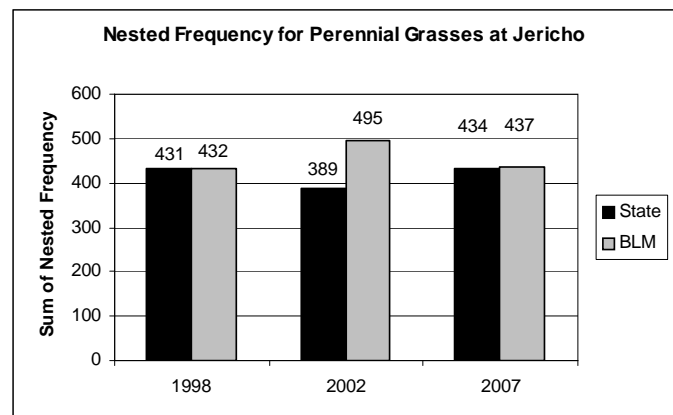
After the wildfire and the treatment, perennial grasses were the key component in the vegetation community on both Jericho studies. In 1998, the average percent cover of perennial grasses was higher on the seeded and chained study (BLM; Figure 1). However, the sum of nested frequency of perennial grasses was nearly identical at both studies (Figure 2). In 2002, both the sum of nested frequency and percent cover of perennial grasses were higher on the seeded and chained study than on the seeded only study. When the studies were re-sampled in 2007, there was no difference in nested frequency or average cover of perennial grasses between the two studies.

Cheatgrass (*Bromus tectorum*) was very abundant at both Jericho studies in 1998 (Figures 3 and 4). Interestingly, cheatgrass had higher percent cover and nested frequency values on the seeded and chained study (BLM) than on the seeded only study. However in 2002, nested frequency and percent cover of cheatgrass were slightly higher on the state section, although both parameters were greatly reduced on both studies due to drought conditions. In 2007, cheatgrass nested frequency and average percent cover were higher on the seeded and chained study than on the seeded only study.

The seeded-only study initially had a very high cover of perennial forbs due to the abundance of two seeded species, alfalfa and yellow sweet clover. In 2002, alfalfa was still moderately abundant but yellow sweet clover was not sampled. Yellow sweet clover is a short-lived species, so this change is not surprising.



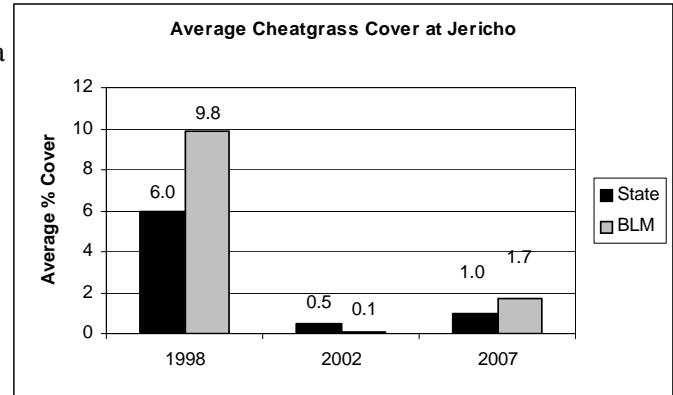
**Figure 1.** Average perennial grass cover from 1998 to 2007 at the Jericho rehabilitation studies.



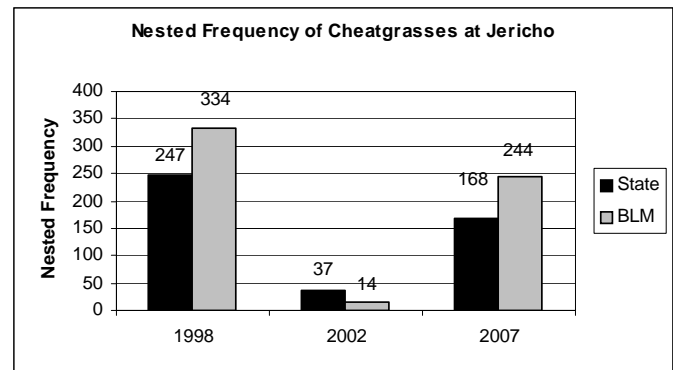
**Figure 2.** The sum of nested frequency of perennial grasses from 1998 to 2007 at the Jericho rehabilitation studies.

Drought conditions and Mormon crickets (*Anabrus simplex*) in 2002 resulted in poor vigor of most alfalfa plants. In 2007, alfalfa was sampled in only 7% of the quadrats, and cover decreased to less than one-tenth of a percent. Very few forbs occur on the seeded and chained study, but no forbs were seeded on this treatment. In 2007, the forb cover and composition were similar on both studies, dominated by the small annual forb desert alyssum (*Alyssum desertorum*).

As mentioned, fourwing saltbush was applied with a dribbler when the Jericho BLM study was chained, but no shrubs were seeded on the state section. The fourwing saltbush population was noted as vigorous and increasing in 1998, but the population decreased in 2002, and most of the population was classified as decadent and having poor vigor. In 2007, there were no young plants and decadence was nearly constant. However, vigor had improved and the average crown and width measurement had increased 14 inches (36 cm) and 19 inches (48 cm), respectively. No shrubs have been sampled on the state section, and due to the distance of any native seed source, it will likely remain so in the future.



**Figure 3.** Average percent cover of cheatgrass from 1998 to 2007 at the Jericho rehabilitation studies.



**Figure 4.** Nested frequency of cheatgrass from 1998 to 2007 at the Jericho rehabilitation studies.